2012 Evidence and Opportunity:
Impacts of the Biosciences in North Carolina

Prepared for:
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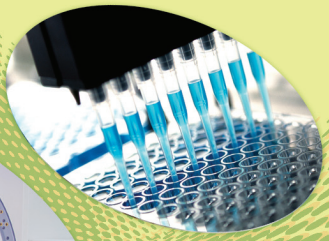


EXECUTIVE SUMMARY

This third biennial independent assessment of the economic impacts of bioscience industry development in North Carolina found that the state's industry not only withstood the toughest of economic times, but in the bottom-line measures of direct job creation, employment impacts and industry competitiveness, continued to advance through the severe recession and weak economic recovery.

These findings point to just what a remarkable success story bioscience industry development has been in North Carolina. In 1984, when just a few companies were applying the new advances in a fledgling field known as biotechnology, the State of North Carolina created the unique model of the North Carolina Biotechnology Center (NCBiotech) to be a catalyst and resource for sustaining economic development in this emerging field. The Center represented the world's first government-sponsored commitment to advancing biotechnology-based economic development with a focus on public-private partnerships and filling key gaps to ensure the growth of this industry in the state.

Few realized in 1984 just how transformative biotechnology would be and how it would open the door to more traditional bioscience industries to develop in North Carolina. Advances in biotechnology have reshaped all aspects of biomedical development from the way we study medicine, discover and develop therapeutics, and diagnose and treat diseases and medical conditions for both humans and animals. Furthermore, advances in biotechnology are having similar transformative impacts on agricultural biosciences for improving, protecting and enriching plants, as well as giving birth to a new industrial biotechnology sector generating bio-based fuels and specialty chemicals.

North Carolina is now among the largest states in bioscience industry development in the U.S. Today, the past distinctions between a biotechnology company and a pharmaceutical or medical products company have fallen away as biotechnology techniques and knowledge are being applied in all traditional bioscience industries.

Looking to the future, the prospects of continued advances in the biosciences look bright. As the National Research Council explains in its study *A New Biology for the 21st Century,* advances in the life sciences have the potential to contribute innovative and mutually reinforcing solutions to global-reaching, societal challenges related to food, environment, energy and health, and at the same time, serve as the basis for new industries that will anchor the economies of the future.[1] A recent OECD study of the bio-economy estimates that based on recognized advances in biological sciences with a high probability of reaching the market, it is expected by 2030 that these bioscience innovations could contribute up to 35 percent of the output of chemicals and other industrial products, 80 percent of pharmaceuticals and diagnostic production, and 50 percent of agricultural output worldwide.[2]

Below are the key findings from this third biennial assessment of the economic impacts of bioscience industry development on North Carolina and the contributions of NCBiotech. The methodology for measuring these economic impacts remains the same as in past years. In order to provide the most current industry employment data to develop economic impacts of the biosciences in 2012, the NCBiotech database of bioscience companies is used. This unique and North Carolina specific database involves ongoing tracking of individual firm employment in the state, including direct outreach to firms by NCBiotech staff. Up-to-date figures through the end of the second quarter were used in generating these results.

[1] National Research Council, A New Biology for the 21st Century, National Academy of Sciences, 2009.

[2] OECD, The Bioeconomy to 2030, 2009, page 199.

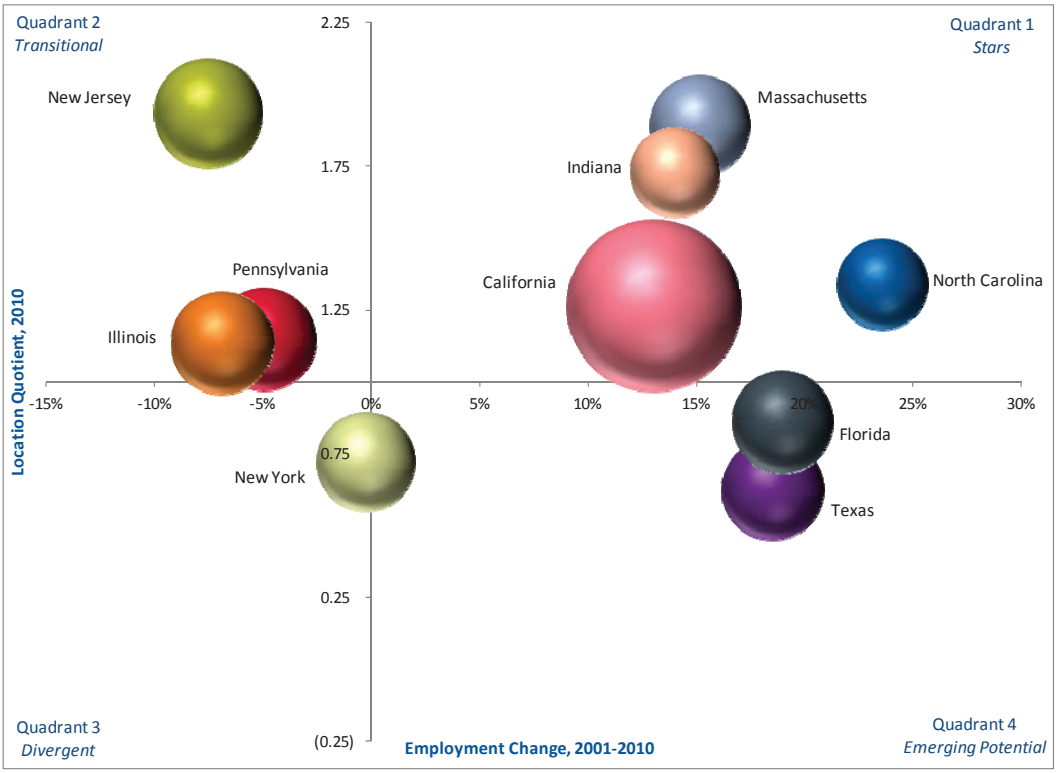
To compare North Carolina to other states, the report uses the Biotechnology Industry Organization's (BIO) definition of the bioscience industry that was developed jointly with Battelle based on selected North American Industry Classification System sectors and measured by industry employment levels reported in the Bureau of Labor Statistics Quarterly Census of Employment and Wages and maintained by IMPLAN. The latest year available for state by state comparisons is 2010. This BIO-Battelle definition was first developed in 2002, and given the changing nature of biological research and its commercial applications, was recently revised in 2012. The biggest change was adding bioscience-related distribution recognizing that the increasingly specialized approaches undertaken in the distribution of drugs, medical devices, and other bioscience-related products includes cold storage and highly-regulated product monitoring as well as new technology for distribution such as automated pharmaceutical distribution systems warrant its inclusion as a major industry subsector.

Competitive Strength Revealed: North Carolina Stands Strong in Bioscience Industry Growth over the Past Decade and Through the Recent Recession to Recovery Period

North Carolina stands out in its rapid growth in the biosciences over the past decade, even compared with national leaders in the sector. Figure ES-1 presents the current employment position for North Carolina and the other states ranked in the top 10 in terms of overall bioscience employment. **Among the ten largest bioscience employer states, North Carolina's 23.5 percent job growth since 2001 has been the fastest**. Since 2001, this translates into nearly 12,000 new jobs in the biosciences for North Carolinians, a total job gain surpassed only by California, Florida, and Texas, three much larger states.

Five of the ten largest bioscience employer states, including North Carolina, have a specialized concentration of employment (meets or exceeds a location quotient of 1.20 or at least 20 percent of the national average concentration of employment). These five states are: New Jersey (Location Quotient is 1.93), Massachusetts (LQ is 1.89), Indiana (LQ is 1.73), North Carolina (LQ is 1.34), and California (LQ is 1.26).

Figure ES-1: Total Bioscience Sector, Degree of Specialization, Employment Growth, and Size, Ten Largest U.S. Bioscience Employer States, 2001–2010

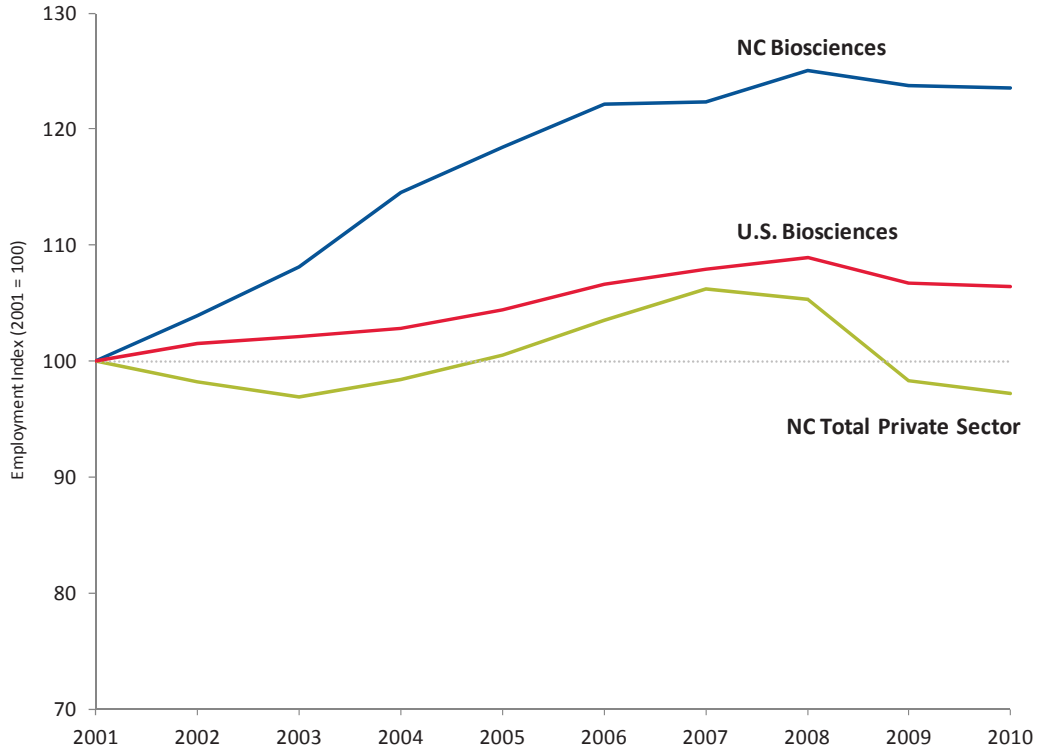


Another sign of the varied and robust nature of North Carolina's bioscience industry base is that it is just one of eleven states nationally with a specialized employment concentration in three or more of the five bioscience subsectors. It has a specialized location quotient in: drugs and pharmaceuticals (LQ is 2.34); research, testing, and medical labs (LQ is 1.39); and agricultural feedstock and chemicals (LQ is 1.20). Since 2001, four of the five major bioscience subsectors contributed to the state's substantial overall job growth with only the smallest sector, agricultural feedstock and chemicals, shedding jobs.

Bolstering the State's Economy In Tough Economic Times: Growth of North Carolina's Bioscience Industry through the Recession and Recovery even as the State's Overall Private Sector Declined Sharply

While bioscience industry employment in North Carolina held its own and even grew slightly through the recession and early years of recovery, private sector employment in North Carolina fell sharply. From a pre-recession high of 3.4 million jobs, private sector jobs fell to a low of 3.1 million in 2010. So, the bioscience industry has helped bolster the state's economy in tough economic times.

Figure ES-2: Employment Growth in North Carolina's Bioscience Sector, 2001–2010



Compared with other top bioscience states, from the economic peak in 2007 through the recession and initial year of recovery in 2010, North Carolina was just one of four states to have added employment. Two of the largest employer states—New Jersey and Pennsylvania—have seen significant job loss as a result of the recession. These states have been especially hard hit by declines in the drugs and pharmaceuticals subsector which has cut jobs in recent years.

Rising Statewide Total Employment Impacts as Bioscience Industry Cluster Development Intensifies: Continued Growth of North Carolina's Bioscience

Industry is Creating Deeper Connections and Higher Multiplier Impacts in the State

The growth of the bioscience industry cluster also boosts North Carolina's supply chains that support this industry. The result is that the total employment impact of each bioscience industry job in generating additional jobs in North Carolina is growing—in other words, with greater cluster development comes rising employment multipliers across North Carolina's economy. This benefit of increased agglomeration is reflected in the IMPLAN Input/Output models through its regional purchase coefficients. Table ES-1 provides the results over time of how direct bioscience jobs impact broader employment in North Carolina.

Of particular note is that the total employment impact of the bioscience industry in North Carolina rose an impressive 57,658 jobs or 32 percent from its level of 180,007 jobs in 2008 to 237,665 in 2012. Helping to drive this considerable rise in total employment impact of the bioscience industry in the state is the higher employment multiplier in North Carolina, so that each direct job in the bioscience industry in 2012 accounts for slightly more than 4 total jobs in the state compared to 3.4 jobs in 2008.

Table ES-1: Comparison of the Employment Impacts from the Economic Contribution of Biotechnology/Bioscience Sector to the North Carolina Economy, 2008, 2010 and 2012

Item	2012	2010	2008
Total Biotechnology Sector			
Direct Impact (Employment)	58,589	56,842	53,182
Indirect Impact (Employment)	84,654	84,494	64,913
Induced Impact (Employment)	94,422	84,487	61,913
Total Impact (Employment)	237,665	226,823	180,007
Total Employment Multiplier (Total Impact Divided by Direct Impact)	4.056	3.990	3.385

Source: Battelle analysis of NCBiotech data using IMPLAN.

As a result of local and national economic conditions, the sector's growth in employment did not translate into an increase in the value of the sector's output or revenues. In a recession, the level of output or sales per job declines reflecting the weaker economic conditions. Given the weak national recovery, output did not rise relative to employment as might be expected in the first year of a recovery. Therefore, it is not surprising that despite the rising level of direct employment in the biosciences, the industry's output generated fell from previous years. Moreover, this decline in post-recession output is not concentrated in the bioscience sector—it occurred across most sectors of the North Carolina economy and occurred nationally as well. Thus, these results are consistent with both overall state and national economic changes.

A Proven Bioscience Catalyst Continues to Generate Economic Dividends: North Carolina Biotechnology Center (NCBiotech) Continues to Have a Growing Impact on Bioscience Development and the North Carolina Economy Overall

Along with the growing employment base, the contributions of NCBiotech to the North Carolina economy have continued to rise, resulting in expanded state and local tax generation. The following tables present the total impacts on the state's economy from ongoing companies in 2012 (compared with previous years) who received loans from NCBiotech (Table ES-2) as well as the total impact of NCBiotech operations/programmatic spending on the state's economy (Table ES-3).

Table ES-2: The Economic Contribution of Currently Active Companies that Received Business Loans on the North Carolina Economy, 2008, 2010, 2012

Item	2012 Total Impact	2010 Total Impact	2008 Total Impact
Number of Companies	74	83	64
Output ($M)	$2,386	$1,355	$818
Employment (# of Jobs)	9,586	5,513	3,734
Labor Income ($M)	$608	$303	$193
State and Local Tax Revenues ($M)	$71	$44	$27

Source: Battelle analysis of NCBiotech data using IMPLAN.

Table ES-3: The Economic Contribution of NCBiotech Operational/Programmatic Spending on the North Carolina Economy, 2010 and 2012 Report (one year lag)

Item	2012 Report Total Impact	2010 Report Total Impact
Output ($M)	$39.4	$35.9
Employment (# of Jobs)	256	239
Labor Income ($M)	$14.0	$12.3
State and Local Tax Revenues ($M)	$1.7	$1.6

* Data for 2008 are not included. The approach in 2008 was not comparable given that research spending was included, but excluded in future years so as not to double count.

Source: Battelle analysis of NCBiotech data using IMPLAN.

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